

Course Title: Digital Logic and System Design

Course Code: CSE 210

Credit Hour: 1.5

Experiment No. 6

Experiment Name: Design a 4-bit ALU with 4-bit parallel adder (IC# 7483).

Tasks:

ALU - Arithmetic and Logical Unit

$$X_i = A_i + S_2 \cdot S_1' \cdot S_0' \cdot B_i + S_2 \cdot S_1 \cdot S_0' \cdot B_i'$$

$$Y_i = S_0 \cdot B_i + S_1 \cdot B_i'$$

$$Z_i = S_2' \cdot C_i$$

Arithmetic -

Input - A , B

S2	S1	S0	Cin	Xi	Yi	Fi = (Xi xor Yi xor cin)	
0	0	0	0	Ai	0	$A + 0 = A$	Transfer
			1	Ai	0	$A + 0 + 1 = A + 1$	Increment
0	0	1	0	Ai	Bi	A+B (Add)	addition
			1	Ai	Bi	A+B+1 (Add)	Add with carry
0	1	0	0	Ai	Bi'	$A + B' = A - B - 1$	Add A with B'
			1	Ai	Bi'	$A + B' + 1 = A - B$	Subtraction
0	1	1	0	Ai	1	$A + 2^n - 1$	Decrement
			1	Ai	1	$A + (2^n - 1) + 1 = A + 2^n$	Transfer

Logical:

S2	S1	S0	Xi	Yi	F = (Xi xor Yi)	
1	0	0	$A_i + B_i$	0	$A + B$ (or)	
1	0	1	A_i	B_i	$A \text{ xor } B$	
1	1	0	$A_i + B_i'$	B_i'	$A . B$	
1	1	1	A_i	1	A'	

$$X_i = A_i + S_2 . S_1' . S_0' . B_i + S_2 . S_1 . S_0' . B_i'$$

$$Y_i = S_0 . B_i + S_1 . B_i'$$

$$Z_i = S_2' . C_i$$

Report:

- 1) Problem Statement
- 2) Instruments (used in this experiment)
- 3) Truth table
- 4) Logic expression
- 5) Logic Diagram
- 6) Discussion